



# Site Safety Management with Application of Safety-related Smart Technologies in HA New Works Contracts 房委會新工程合約應用安全相關的智慧科技 提升工地安全管理

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1. **Policy and Safety Targets** 策略和安全指標
2. **Safety Performance** 安全表現
3. **Site Safety Management** 工地安全管理
4. **Implementation of BIM and Smart Technologies for Safety**  
實施建築信息模擬和安全智慧科技

# 1. Policy and Safety Goals 策略和安全指標



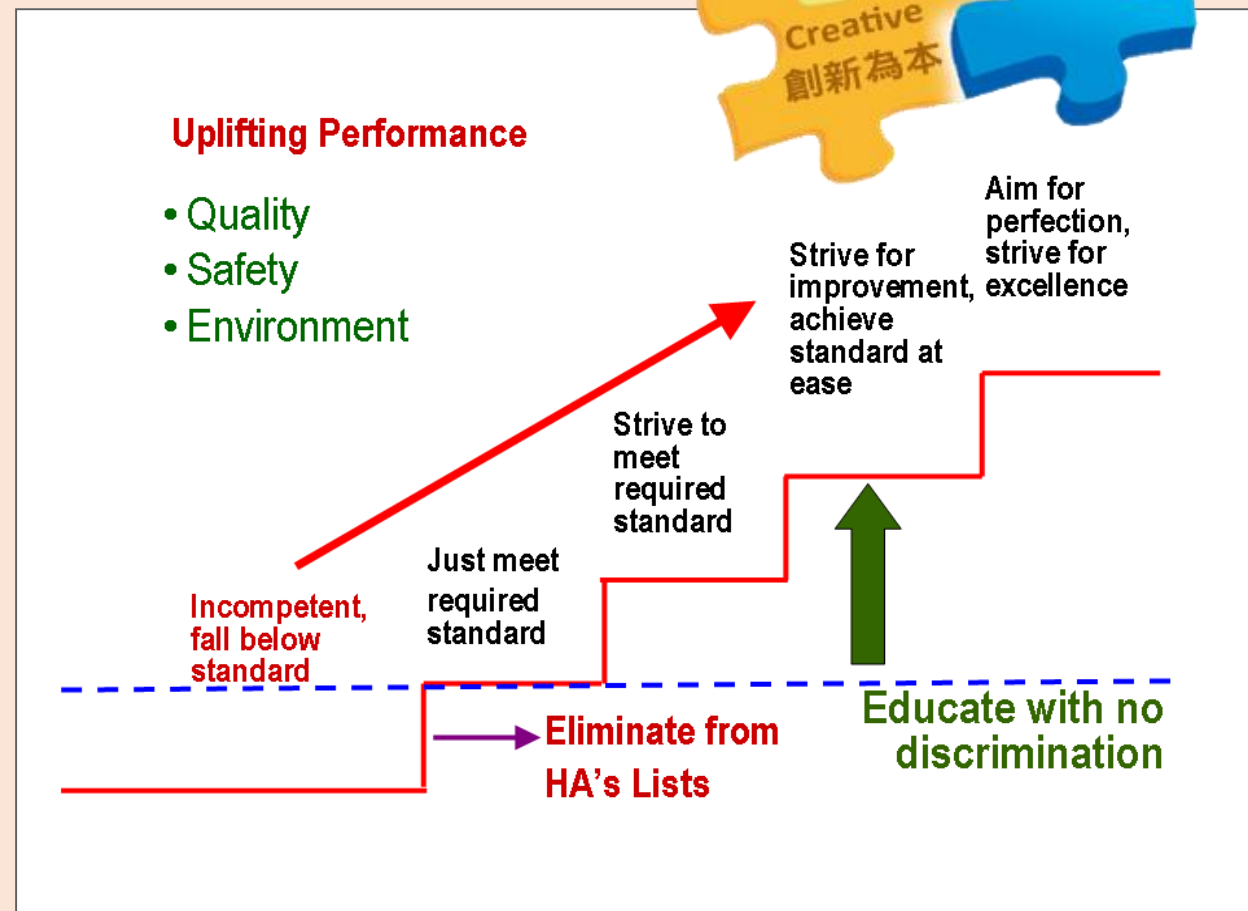
Our Policy :

Strengthen **Risk Management in Procurement, Tenders and Contracts**

- Encourage contractors and service providers to make **continuous improvement** and **strive for excellence in performance**

Ongoing Safety Targets and Performance Goals

- Zero Fatal Accident**
- Accident rate limit lowered from 9 to 8 Accidents per 1,000 workers (from April 2023 onwards)**

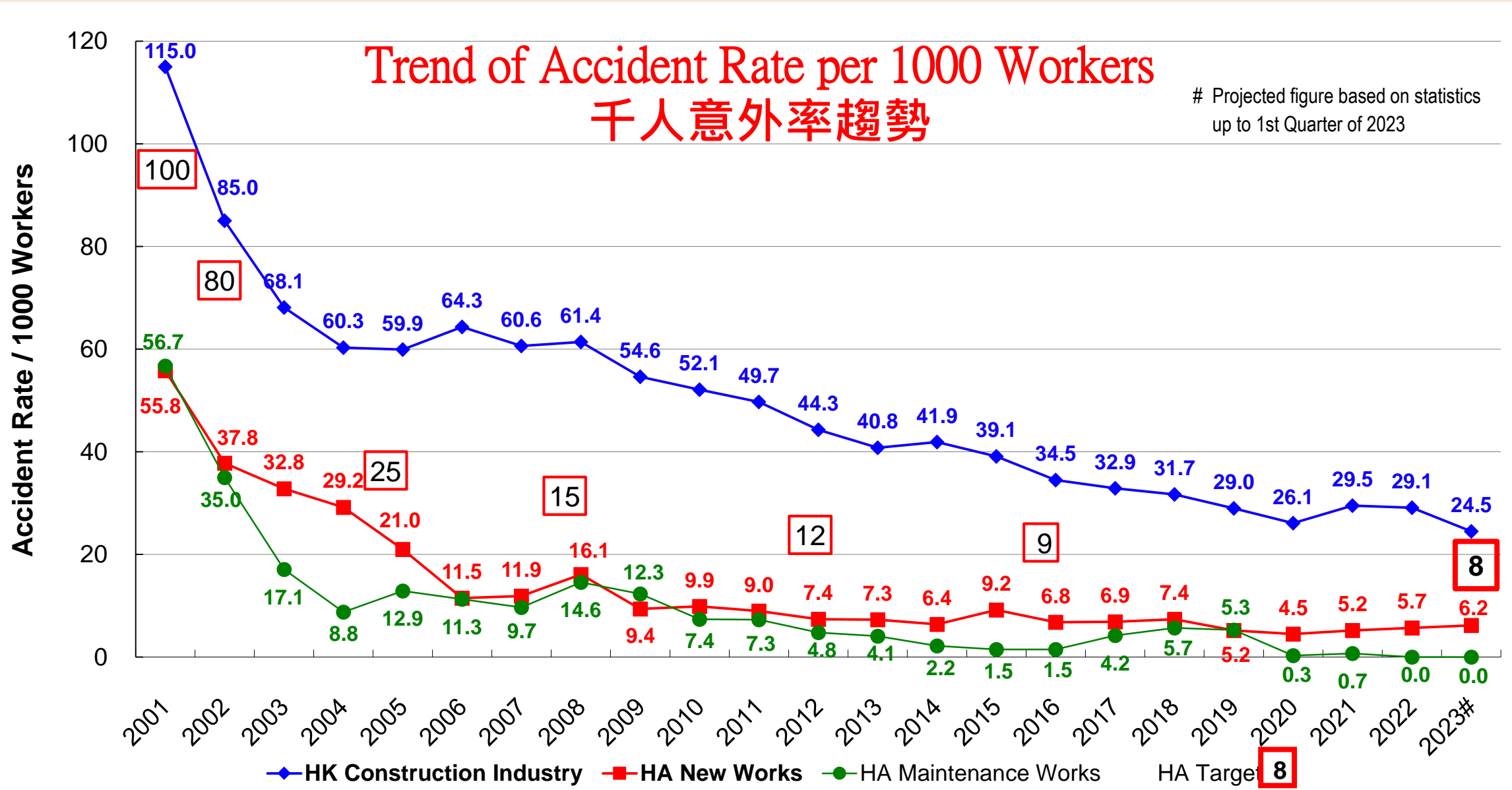


incident

## 2. Safety Performance 安全表現



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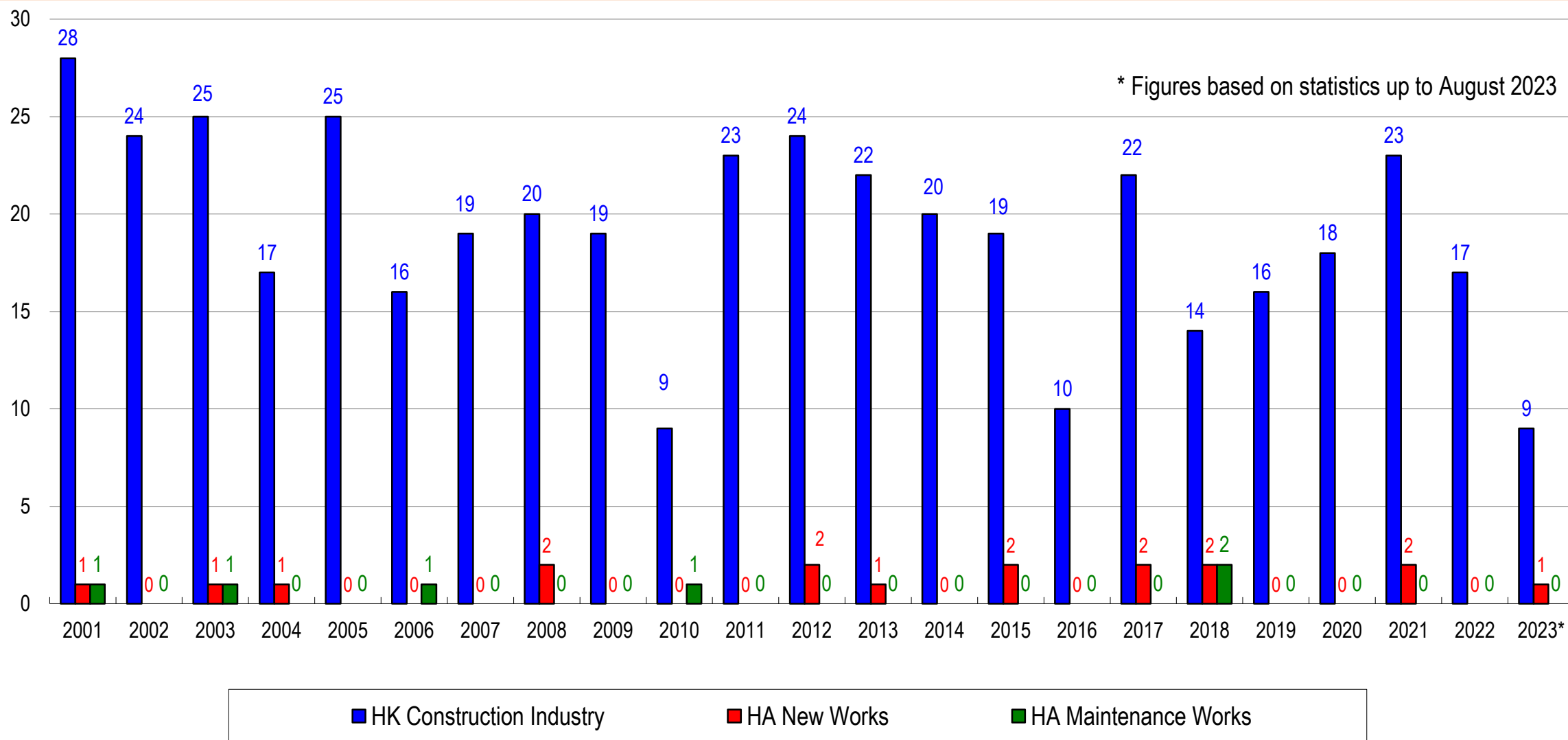


## 2. Safety Performance 安全表現



### Construction Industry Fatal Accidents 建造業致命意外

\* Figures based on statistics up to August 2023



0 incident

### 3. Site Safety Management 工地安全管理



作出承擔和投放資源  
以促進工地安全

Through various channels  
In day-to-day practice:  
Impact on commitment  
and resource input  
from our business partners

僱主承建商及  
服務供應商



供應鏈上的  
持份者



o  
incident

### 3. Site Safety Management 工地安全管理



#### Three Pronged Approach in Promoting Safety 三管齊下安全管理方式

採購策略和表現監察

##### Prong 1: Procurement Strategy & Performance Monitoring



合約規管和工程管理

##### Prong 2: Contract Requirements & Administration



研究、推廣宣傳和訓練

##### Prong 3: Partnership through Research, Promotion and Training





### 3. Site Safety Management 工地安全管理

**Challenges** : Ageing work force, shortage of site supervisory personnel

Enhancing quantity, speed, efficiency and quality

**Contract Requirement and Administration**

- Promoting best practices, over and above legal requirements

**Strengthen site and safety management**

鞏固工地的安全管理

**Improve physical conditions on site**

優化工地的工作環境

**Enhance safety awareness**

提升行業的安全意識



## 4. Implementation of BIM and Smart Technologies for Safety

### 實施建築信息模擬和安全智慧科技

#### Tender Stage 投標階段

- Tenderers' **innovative proposal** into tender assessment

#### Construction Stage 施工階段

- **Pay for Safety for safety innovation** 安全支付計劃鼓勵創新意念  
(e.g. for 550M 28-month building contract, pay for safety is 5.661M including pay for safety at \$75,480 for safety innovation, which is about 0.014% of building contract sum)
- **BIM** included into standard specification **建築信息模擬**納入標準建築規格  
(building and foundation contracts)
- **Smart technologies** 智慧科技  
(building, foundation, demolition, civil and geotechnical engineering contracts)



## 4. Implementation of BIM and Smart Technologies for Safety

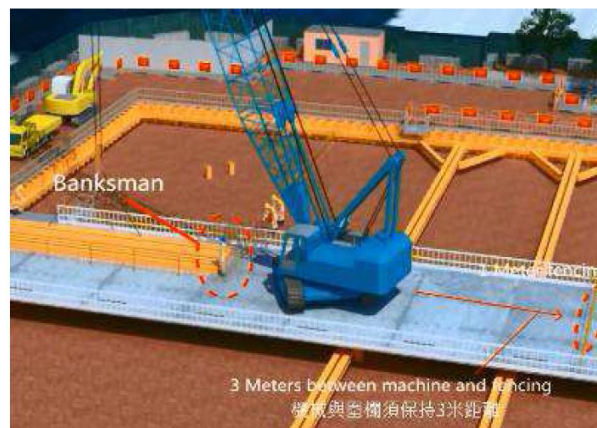
### 實施建築信息模擬和安全智慧科技

#### 4.1 Building Information Modelling (BIM) 建築信息模擬

- Plan site logistics and **visualize working procedures**, e.g. demonstration of precast element storage, lifting and installation of various types of precast units
- Facilitate communication, effective way of explanation of **method statement** and foreseeable **hazards and risks, enhance site safety**



Picture.5



Picture.6





# 4. Implementation of BIM and Smart Technologies for Safety

## 實施建築信息模擬和安全智慧科技

### 4.2 Smart Technologies 智慧科技

#### 1. Authentication of plant operator

##### 驗證機械操縱人員身份

- Only authorised plant operator can start the machine, e.g. forklift truck, mobile elevated work platform
- Use of **wireless communication technology**
- For material hoist, **RFID card** and **facial recognition** for identification
- Apply to mobile plant and material hoist



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# 4. Implementation of BIM and Smart Technologies for Safety



## 實施建築信息模擬和安全智慧科技

### 4.2 Smart Technologies

#### 2. Controlling access to specific zone

##### 管理工友進出特定施工區域

- **Wireless communication technology** to monitor entry to danger zone, e.g. lift shaft
- **Internet of things sensor (RFID emitter and sensor)** at each lift lobby, RFID tag to safety helmet of workers permitted to enter lift shaft, other workers without RFID tags entering lift shaft will trigger alert
- Lifting zone / confined space / basement
- **Artificial intelligence computer vision** to oversee and analyse entry of workers into these areas, unauthorized entry will trigger alert
- Identity of workers, time and period of entry are recorded



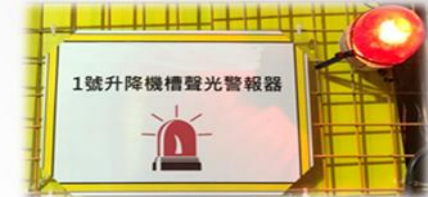
RFID感應天線



RFID晶片安全帽



已安裝RFID管理系統之升降機槽



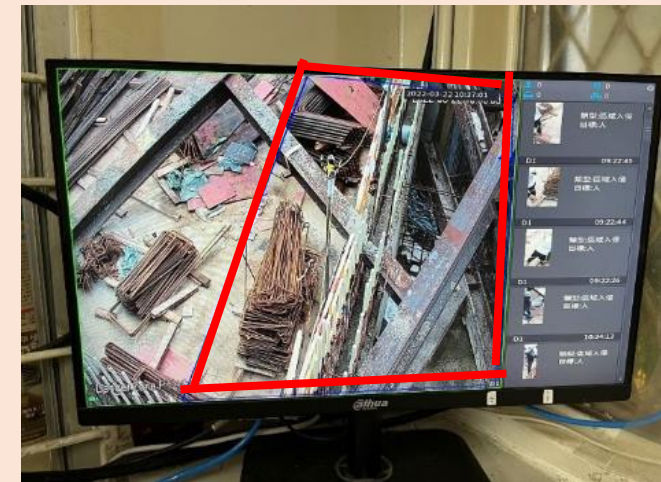
正在觸發警報之警報器



展示於升降機大堂之實時工作人數顯示屏



RFID升降機槽管理系統



# 4. Implementation of BIM and Smart Technologies for Safety



## 實施建築信息模擬和安全智慧科技

### 4.2 Smart Technologies

#### 3. Detecting unsafe act of workers or conditions

##### 偵察不安全行為或情況

##### 1) Detecting hook height of tower crane

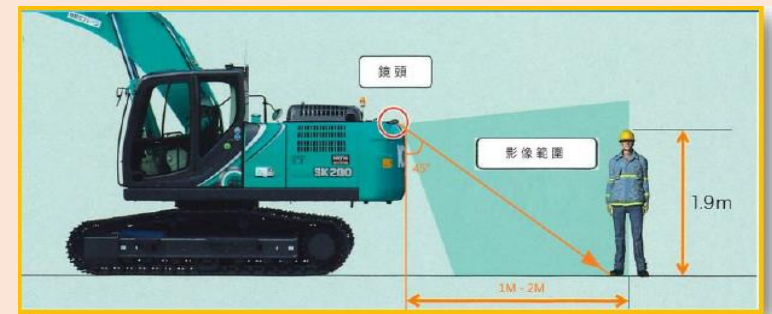
##### 感應天秤吊鉤高度

- Sensors (e.g. RFID) erected at the lifting zone
- RFID tag installed on the lifting hook
- Sensors detecting the lifting hook within preset height and triggering visual and audio alarms

##### 2) Detecting entry into manoeuvring zone of mobile plant

##### 偵測工友進入機械操作範圍

- Sensors (e.g. RFID / ultrasonic) or artificial intelligence (AI) computer vision installed on mobile plant
- Sensors / AI detecting the persons in close proximity of plant and triggering visual and audio alarms



## 4. Implementation of BIM and Smart Technologies for Safety



### 實施建築信息模擬和安全智慧科技

#### 4.2 Smart Technologies

##### 3. Detecting unsafe act of workers or conditions (cont'd)

##### 偵察到不安全行為或情況

##### 3) Detecting vehicle height at ingress / egress

##### 地盤出入口安裝系統偵察車輛高度

- Sensors (e.g. infrared) erected at the site entrance
- Sensors detecting vehicle height and triggering visual and audio alarms



##### 4) Detecting proper gate closing of material hoist

##### 監察物料升降機閘門正確關閉

- Sensors (e.g. infrared) installed on gates
- No operation of material hoist in case gates are not closed





## 4. Implementation of BIM and Smart Technologies for Safety

### 實施建築信息模擬和安全智慧科技

#### 4.2 Smart Technologies

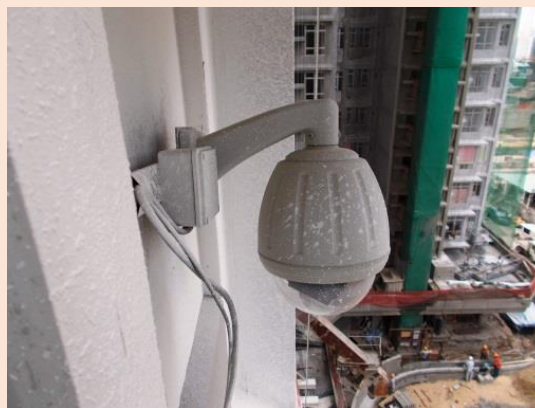
#### 3. Detecting unsafe act of workers or conditions (cont'd)

#### 偵察到不安全行為或情況

##### 5) AI detecting safety helmet and reflective vest

人工智能偵測吊運區工友戴安全帽及穿反光衣

- Cameras installed at lifting zone and trolley of tower crane
- Video captured is analysed by AI for detecting proper wearing of safety helmet and reflective vest in the lifting zone of tower crane.
- System to trigger reminder to site supervisory personnel
- Information Management Platform at contractor's site office for continuous monitoring, providing statistics for analysis and specific safety training





## 4. Implementation of BIM and Smart Technologies for Safety

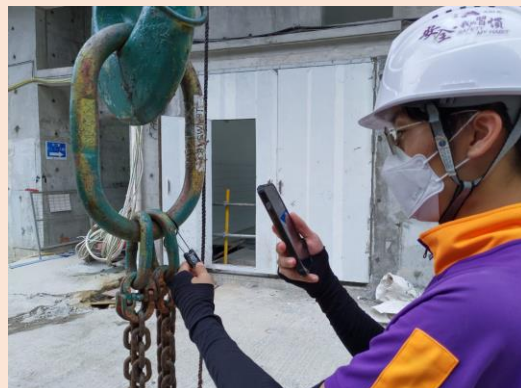
### 實施建築信息模擬和安全智慧科技

#### 4.2 Smart Technologies

#### 4. Checking and updating information of plant, equipment and worker

#### 檢查及管理機械、工具及工友資料

- Setting up **database**
- Adding **code** (e.g. QR code) onto plant, equipment and helmet of workers
- Scanning code by **mobile device**
- **Retrieving information instantly** on site
- Plant data: model number, manufacture date, certificate of overhaul, list of authorized operators, record of test, examination and inspection, etc.
- Equipment data: safe working load, latest testing and examination date
- Worker data: name, employer data, registered trade, records of training and safety performance





# 4. Implementation of BIM and Smart Technologies for Safety

## 實施建築信息模擬和安全智慧科技

### 4.2 Smart Technologies

### 5. Project Information

Management and Analytic Platform for capturing data from sensors and detectors

### 項目資訊管理及分析平台

- Collecting information from Internet of Things sensors and AI computer vision detectors
- Facilitating real time monitoring
- Providing summary statistics for analysis and site safety training
- Facilitating formulation of enhancement measures to improve site safety



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# 4. Implementation of BIM and Smart Technologies for Safety

## 實施建築信息模擬和安全智慧科技

### 4.2 Smart Technologies

#### Trial use of IoT sensors and AI based safety-related technology

#### 應用物聯網感應器及人工智能科技

| Contract Type                 | IoT Sensor  | AI Computer Vision  |
|-------------------------------|---|---|
| Tung Chung Foundation Site    | Real time tracking the locations and health status of workers |   |
| Tung Chung Building Sites     | Proximity detection of workers in proximity of plant          | 4G AI wider angle detecting and recording workers who are not wearing safety helmet and chin strap for fixed lifting zone |
| Tsing Hung Road Building Site |   | Workers counted based on the color of helmet and detecting workers working at height                                      |



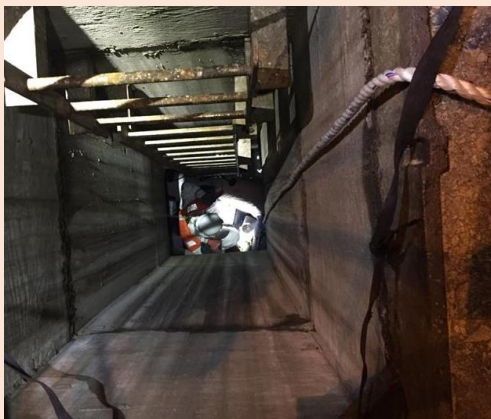
# 4. Implementation of BIM and Smart Technologies for Safety

## 實施建築信息模擬和安全智慧科技

### 4.2 Smart Technologies - Way Forward 前瞻



Detecting proper application of lifting method, outrigger and lifting gear, inappropriate behaviour of operator by AI



Monitoring underground drainage work by camera



Monitoring worker's conditions



E-processing of work permit

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# 4. Implementation of BIM and Smart Technologies for Safety

## 實施建築信息模擬和安全智慧科技

### 4.2 Smart Technologies - Way Forward (cont'd)

- promoting knowledge of smart technologies
- exploring to apply Construction Innovation and Technology Fund (CITF) (建造業創新科技基金) technologies for safety and health monitoring
- promoting contractors to make more use of CITF



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http://www.housingauthority.gov.hk/sitesafety

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# 工地安全 零事故 incident

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工地安全研討會2021

最新消息

- [新工程合約工地安全講座 2023] 新工程合約工地安全講座將於2023年11月10日舉行
- [安全研討會 2023] [安全研討會 2023] 安全研討會已於2023年9月28日舉行
- [突擊巡查] 工地突擊巡查制度指引 (2022第17次版, 只提供英文版本)
- [安全稽核] 房屋委員會安全稽核制度1.7版 (只提供英文版本)
- [安全稽核] 房屋委員會升降機及電梯指定分包合約安全稽核制度1.3版 (只提供英文版本)

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樓宇保養及維修工程 安全手冊

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